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ORIGINAL ARTICLE

The burden of intentional self-poisoning on a district-level public Hospital in Cape Town, South Africa

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A B S T R A C T

Introduction: Intentional self-poisoning is a significant part of the toxicological burden experienced by emergency centres. The aim of this study was to describe all adults presenting with intentional self-poisoning over a six-month period to the resuscitation unit of Khayelitsha Hospital, Cape Town.
Methods: Adult patients with a diagnosis of intentional self-poisoning between 1 November 2014 and 30 April 2015 were retrospectively analysed after eligible patients were obtained from the Khayelitsha Hospital Emergency Centre database. Missing data and variables not initially captured in the database were retrospectively collected by means of a chart review. Summary statistics were used to describe all variables.
Results: A total of 192 patients were included in the analysis. The mean age was 27.3 years with the majority being female (n = 132, 68.8%). HIV-infection was a comorbidity in 39 (20.3%) patients, while 13 (6.8%) previously attempted suicide. Presentations per day of the week were almost equally distributed while most patients presented after conventional office hours (n = 152, 79.2%), were transported from home (n = 124, 64.6%) and arrived by ambulance (n = 126, 65.6%). Patients spend a median time of 3h37m in the resuscitation unit (interquartile range 1 h 45 m–7 h 00 m; maximum 65 h 49 m). Patient acuity on admission was mostly low according to both the Triage Early Warning Score (non-urgent n = 100, 52.1%) and the Poison Severity Score (minor severity n = 107, 55.7%). Pharmaceuticals were the most common type of toxin ingested (261/343, 76.1%), with paracetamol the most frequently ingested toxin (n = 48, 25.0%). Eleven patients (5.7%) were intubated, 27 (14.1%) received N-acetylcysteine, and 18 (9.4%) received benzodiazepines. Fourteen (7.3%) patients were transferred to a higher level of care and four deaths (2%) were reported.
Discussion: Intentional self-poisoning patients place a significant burden on emergency centres. The high percentage of low-grade acuity patients managed in a high-acuity area is of concern and should be investigated further.

African relevance

- Self-inflicted drug overdose occurs frequently.
- Paracetamol is the drug of choice.
- The low-grade acuity of most toxicology patients raises the question of over triaging.

Introduction

Poisoning is worldwide a common cause for morbidity and mortality. The World Health Organization (WHO) estimated that 108 000 people died from poisoning in 2015 [1]. Poisoned patients often present to emergency centres; the incidence in emergency centres in international non-African facilities can be as high as 10% [2]. A similar trend has been witnessed in Africa, where 1.9% of emergency centre visits in Botswana and 2.4% in western Kenya related to poisoning [3,4].

Intentional self-poisoning occurs globally across all levels of income [5,6]. These self-harm episodes are not accidents; they are deliberate actions taken by patients to escape from complex and distressing life circumstances [7]. A population-based cohort study also indicated that intentional self-poisoning is a strong predictor of subsequent suicide (23%) and even premature death [8].

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Intentional self-harm in South Africa during 2015 ranked 6th of all non-natural deaths; 0.9% of non-natural deaths and 0.1% of all causes of death [9]. However, this number must be interpreted with caution as nearly three-quarters of non-natural causes of death were not adequately classified. Furthermore, this number also includes trauma-related causes of self-harm and are not only due to poisoning. Specific data on intentional self-poisoning in South African adults are thus limited. A one-year review of Tygerberg Poison Information Centre consultations indicated that 61% of adult cases were due to intentional exposures [10]. This trend was even higher (81%) in adults admitted with acute poisoning to the Tygerberg Academic Hospital, Cape Town [11]. What's more, 8% of all adult admissions to Khayelitsha Hospital (another Cape Town hospital) were as a result of intentional self-poisoning [12]. The percentage increased substantially to 23% in patients between the ages of 13 and 18 years [12]. The high incidence of toxicology-related cases warranted a more in-depth review of these patients and subsequently led to this study.

South Africa is laden with a quadruple burden of disease (i.e., high HIV/Tuberculosis burden; high maternal and child mortality; high levels of violence and injuries; and a mounting burden of non-communicable diseases) [13] which often distracts the focus from other health problems. More information is needed to deepen the understanding of the burden that toxicological presentations have on South African health services. Additionally, areas need to be identified that require further study and offer potential solutions to improve the quality of care offered to these patients. The aim of this study was to describe all intentional self-poisoning exposures in adults that presented to the resuscitation unit of Khayelitsha Hospital, Cape Town over a six-month period.

Methods

A retrospective analysis of a prospectively collected observational database combined with a retrospective chart review to include additional variables was performed. The study was approved by the Stellenbosch University Health Research Ethics Committee (Ref: N14/08/102A) and included a waiver of informed consent. The waiver of consent was granted on the basis that 1) the retrospective nature of the study made obtaining consent impractical; 2) all personal and identifiable information were removed and the data immediately coded after the collection thereof; and 3) there was no interest in individual patients, only in the specific toxins they took and the effect thereof.

Primary level health services in South Africa are provided through local clinics and 24-h community health centres. Hospitals provide higher-level services and are divided into district (level 1), regional (level 2), or tertiary/central (level 3) hospitals [14]. District hospitals provide basic diagnostic and therapeutic services and specialist services are not always available [14].

Khayelitsha Hospital is a 240-bed medical facility on the outskirts of the Cape Town Metropole. It provides district-level health care to approximately 500 000–1 500 000 people in the Khayelitsha area [15]. The emergency centre manages about 30 000 patients per annum and has a 30% admission rate (personal communication: Dr S Lahri, November 2016). Consultant emergency physicians are typically present from 08 h 00 to 16 h 00 on weekdays with telephonic assistance outside these hours. The resuscitation unit has five monitored beds, four adult and one paediatric cot, and forms part of the emergency centre. Formal admission criteria to the resuscitation unit does not exist and patients with a high acuity score according to the South African Triage Scale are preferably managed within the resuscitation unit [16].

An observational electronic database (The Khayelitsha Hospital Emergency Centre database) was established on 1 November 2014. Data are prospectively collected on all patients managed within the resuscitation area by means of a tailored smartphone application as previously described [12].

All adult patients (≥13 years) with a diagnosis of intentional self-poisoning were extracted from the database for a six-month period (1 November 2014 until 30 April 2015).

Key variables collected were age, gender, acuity, toxin exposure (route, severity, toxin), diagnostic tests performed and interventions received in the resuscitation unit, time spent in the resuscitation unit, disposition from the resuscitation unit, and in-hospital mortality. Missing data and variables not initially captured in the database were retrospectively collected by means of a chart review.

Patient acuity was measured using the Triage Early Warning Score (TEWS) as part of the South African Triage Scale [16]. The TEWS is a composite score representing physiologic parameters at triage [16]. There are different age appropriate versions and it categorises patients as Emergency (Red), Very urgent (Orange), Urgent (Yellow), and Non-urgent (Green) [16].

The Poisoning Severity Score was retrospectively calculated and used to determine the severity of poisoning on admission [17]. The Poisoning Severity Score can be used in all age groups and takes the observed clinical symptoms and signs into account [17]. It grades the severity of poisoning as None (no symptoms or signs related to poisoning), Minor (mild, transient and spontaneously resolving symptoms), Moderate (pronounced or prolonged symptoms), and Severe (severe or life-threatening symptoms) [17].

Means to identify the alleged toxins were left to the treating doctors' discretion. Various methods were used and included obtaining a clinical history from patients themselves, relatives or friends; gaining information by scrutinising the containers of the alleged poisons; and sending samples of body fluids to the toxicology laboratory for identification. Individual agents were categorised into toxin type and toxin group; e.g., paracetamol (acetaminophen) was categorised as toxin type: pharmaceuticals, toxin group: analgesics and antipyretics.

Patients with partially missing data were included for analysis except where analyses involved the specific missing variable. Summary statistics were used to describe all variables.

Results

A total of 201 patients were extracted from the database (n = 2324). Nine were further excluded due to being incorrectly labelled as intentional self-poisoning (n = 5), driving under the influence of alcohol (n = 3), and missing folder (n = 1), thus 192 (8.3% incidence) were included in the analysis.

Intentional self-poisoning mostly occurred in females (n = 132, 68.8%) and in younger patients (mean age 27.3 yrs (standard deviation = 10.7 yrs), < 25 yrs n = 91 (47.4%), 25–35 yrs n = 65 (33.9%), > 35 yrs n = 36 (18.8%)). The exposure route was orally in all patients (n = 192; 100%). HIV-infection was the most common comorbidity (n = 39, 20.3%), followed by psychiatric illness (n = 14; 7.3%), pregnancy (n = 12; 6.3%), and neurological disease (n = 5; 2.6%). Thirteen patients (6.8%) had previous suicide attempts.

Most patients (n = 152; 79.2%) presented outside office hours (office hours i.e., Monday to Friday 08 h 00–16 h 00). Presentations per day of the week were almost equally distributed, while most patients were transported from home (n = 124; 64.6%) and arrived by ambulance (n = 126; 65.6%) (Table 1). The median time patients spent in the resuscitation unit was 3 h 37 m (interquartile range (IQR) 1 h 45 m–7 h 00 m). This finding is similar to previously reported times of all patients in the same unit (median 3 h 15 m, IQR 1 h 10 m–6 h 20 m) [12]. Four patients stayed more than 24 h in the unit (maximum time = 65 h 49 m).

Most patients were categorised by TEWS as non-urgent (n = 100; 52.1%) and by the Poison Severity Score as minor severity (n = 107; 55.7%) (Table 1).

A total of 343 toxins were ingested. The maximum number of toxins ingested by one patient was eight (one toxin: n = 108, 56.3%; two toxins: n = 46, 24.0%, three or more toxins: n = 38, 19.8%). Pharmaceuticals were the most common type of toxin ingested (261/

Table 1
Presentations and acuity of patients with intentional self-poisoning to the resuscitation unit of Khayelitsha Hospital.

Day of week	n	%
Sunday	32	16.7
Monday	19	9.9
Tuesday	31	16.1
Wednesday	29	15.1
Thursday	30	15.6
Friday	22	11.5
Saturday	29	15.1
Time of day	**n**	**%**
00:00–07:59	51	26.6
08:00–15:59	52	27.1
16:00–23:59	89	46.4
Transported from	**n**	**%**
Home	124	64.6
Healthcare facility	65	33.9
Unknown	3	1.6
Transported by	**n**	**%**
Ambulance	126	65.6
Self	61	31.8
Police	1	0.5
Unknown	4	2.1
Triage Early Warning Score	**n**	**%**
Emergency (Red)	7	3.6
Very urgent (Orange)	22	11.5
Urgent (Yellow)	42	21.9
Non-urgent (Green)	100	52.1
Incomplete vital signs	21	10.9
Poison Severity Score	**n**	**%**
0 (None)	48	25.0
1 (Minor)	107	55.7
2 (Moderate)	26	13.5
3 (Severe)	11	5.7

343; 76.1%), followed by Insecticides and pesticides (23/343; 6.7%), and Household products (20/343; 5.8%). Paracetamol was the most frequently ingested toxin (n = 48; 25.0%) of which 15 patients had toxic levels (Fig. 1). A breakdown of the toxins per toxin group is presented in Table 2.

Table 2
Toxins ingested by patients presenting with intentional self-poisoning to the resuscitation unit of Khayelitsha Hospital.

Toxin group	n	%
Analgesics and antipyretics	68	19.8
Cardiovascular medicine	44	12.8
Antivirals	28	8.2
Antibiotics	27	7.9
Vitamins and minerals	24	7.0
Antihistamine	15	4.4
Corrosives	13	3.8
Cholinesterase inhibitors	11	3.2
Neurological (incl. anti-psychotics)	11	3.2
Irritants	9	2.6
Rodenticides	9	2.6
Other	63	18.4
Unknown	21	6.1
Total	343	100

Blood gas measurements were done in 181 (94.3%) patients and an ECG in 174 (90.6%) patients. Eleven patients (5.7%) were intubated (Table 3). Intravenous fluids (n = 82; 42.7%) and *N*-acetylcysteine (NAC) (n = 27; 14.1%) were the most frequently used interventions (Table 4).

A total of 154 patients (80.2%) were managed by the emergency centre clinicians after disposition from the resuscitation unit. Fourteen (7.3%) patients were referred to facilities able to provide a higher level of care, 13 (6.8%) were managed by other in-hospital services at Khayelitsha Hospital, and 9 (4.7%) were directly discharged from the unit. Two patients (1%) died while in the resuscitation unit; a further two died at the referral hospital (overall mortality 2.1%). The four deaths are describe in Table 3.

Discussion

Our study describes intentional self-poisoning cases managed in the resuscitation unit of a district-level hospital. The incidence of self-poising was 8.3% although most patients (81%) presented with no or minor symptoms and thus had a low severity grading (81%). Patients presented outside normal office hours (79%), and frequently ingested pharmaceuticals (76%); a quarter of the patients ingested paracetamol. HIV infection was the most common comorbidity (20%). Patients stayed, on average, more than three hours in the resuscitation unit. This

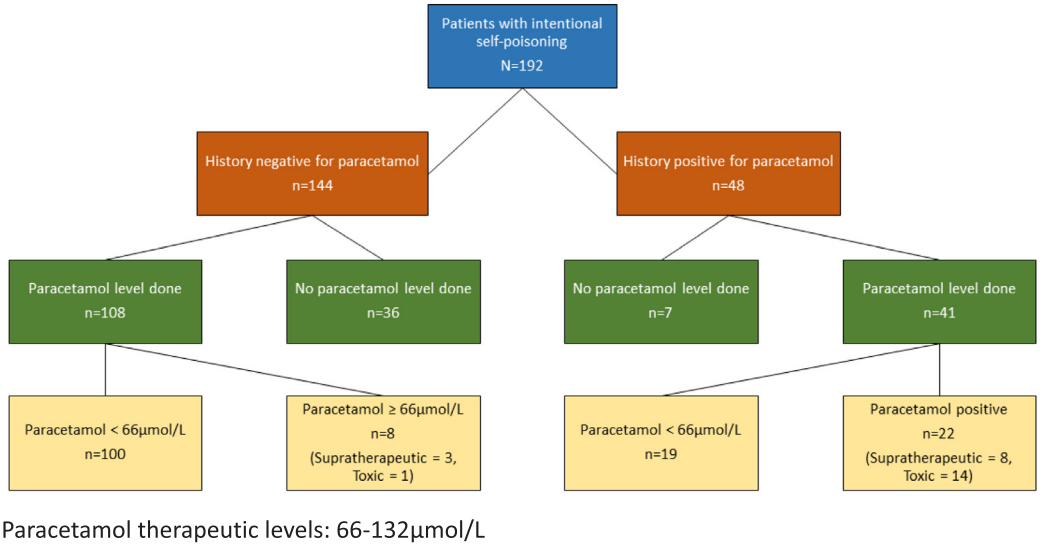

Fig. 1. Breakdown of paracetamol ingestion in patients presenting to the resuscitation unit of Khayelitsha Hospital with intentional self-poisoning.

Table 3
Patients managed in the resuscitation unit of Khayelitsha Hospital after intentional self-poisoning who were either intubated or died.

Case	Age (yrs)	Gender	Co-morbidities	Toxin(s)	Time in resuscitation unit (mins)	Length of hospital stay (days)	In-hospital mortality
1	16	F	Nil	Amlodipine	1350	7	No
2	35	F	Nil	Traditional medicine	725	10	No
3	18	M	Nil	Carbamazepine, Phenytoin	840	7	No
4	35	M	HIV	Atrozia[a] (with hanging attempt)	125	5	No
5	24	M	Nil	Organophosphate	35	0	Yes
6	34	M	Psychiatric illness	Ethylene glycol, SSRI[b]	390	3	No
7	29	M	Nil	Amlodipine, Atenolol, Bisoprolol, Enalapril, Hydrochlorothiazide, Paracetamol, Phenytoin	560	11	No
8	32	F	Psychiatric illness	Brake fluid	295	1	No
9	18	M	Drug abuser	Paving cleaner	310	0	Yes
10	16	F	Nil	Anti-retroviral drugs, Baclofen	185	3	No
11	25	F	HIV[c], TB[d]	Unknown	300	0	Yes
12*	18	F	HIV	Organophosphate (suspected)	1170	4	Yes

[a] A combination pill containing three antiretroviral drugs (efavirenz, emtricitabine and tenofovir).
[b] Selective serotonin reuptake inhibitor.
[c] Human immunodeficiency virus.
[d] Tuberculosis.
* Not intubated (all other patients were intubated).

Table 4
Interventions to patients presenting with intentional self-poisoning to the resuscitation unit of Khayelitsha Hospital.

Intervention	n	%
Intravenous fluids	82	42.7
N-Acetylcysteine (NAC)	27	14.1
Benzodiazepines	18	9.4
Calcium gluconate/chloride	14	7.3
Potassium chloride (KCL)	14	7.3
Inotropes	9	4.7
Intralipids	9	4.7
High-dose Insulin Euglycemic Therapy (HIET)	9	4.7
Thiamine	8	4.2
50% Dextrose	8	4.2
Sodium Bicarbonate	6	3.1
Pyridoxine	5	2.6
Atropine	5	2.6
Deferoxamine	4	2.1
Naloxone	2	1.0

suggests that intentional self-poisoning patients (albeit mostly with a low acuity) place a significant burden on high-acuity areas within district level healthcare facilities. Healthcare personnel working within these acute care settings should thus be well equipped to recognise and swiftly dispose of non-urgent toxicology cases to better use the limited high-acuity areas more appropriately.

This is the first study presenting comprehensive data on intentional self-poisoning patients specifically managed in the resuscitation unit of a district-level emergency centre. A similar study was conducted in Durban, KwaZulu-Natal, which included adult parasuicide patients (98% toxin ingestion) presenting to the emergency centre itself and not only to a high-acuity area within the emergency centre [18]. The results were similar with regard to patient age (27.3 years vs. 25 years), gender (68.8 female vs. 70% female), and mortality (1 vs. 1%). However, more patients in our study were triaged as non-urgent/green (52.2 vs. 27.7%), presented after hours (79.2 vs. 61%), and were transferred to a higher level of care (7.3 vs. 3%). Our study only included patients managed within the resuscitation unit and would have missed patients cared for in lower-acuity areas within the emergency centre.

The high number (79%) of after-hour presentations is notable, as it correlates with the periods when specialist emergency medicine physicians are not always physically at the hospital. It is thus extremely important that junior doctors are well-trained to handle toxicology-related patients. Local poison information centres are usually very helpful and can also play a key role in assisting doctors in planning the appropriate management of these patients.

The high percentage of low-acuity patients is worrisome. In district-level health institutions, the resuscitation unit is often the only monitored area outside of theatre and is thus reserved for the sickest patients. It is therefore a highly sought after and limited resource. Inappropriate use of the resuscitation unit needs to be identified and rectified and is underpinned by the principle of distributive justice. At Khayelitsha Hospital, patients categorised by the South African Triage Scale as very urgent (orange) or emergent (red) should preferably be managed within the resuscitation unit. However, the South African Triage Scale uses clinical questions at presentation to automatically categorise patients with poisoning or overdose as very urgent (orange) regardless of the patient's physiological parameters [16]. An approach like this implies that all toxicology-related patients should be managed within the resuscitation unit, putting a significant but likely unnecessary burden on an extremely limited resource. On the other hand, toxicology-related patients might deteriorate quickly and physiologically based warning scores initially under triage asymptomatic toxic patients. The South African Triage Scale therefore acts as a failsafe for these patients. An appropriate balance is needed and it might be worthwhile to investigate triaging only certain ingestions into a higher acuity category. This might allow better identification of true high risk cases.

Paracetamol is worldwide one of the most frequently used drugs associated with toxicology-related morbidity and mortality [19,20]. The prevalence of intentional paracetamol overdose in Khayelitsha Hospital (25%) is comparable to the limited reported prevalence in other South African state institutions (20–27%) [11,21,22], and might justify why 78% of patients in the resuscitation unit had a paracetamol level done as part of their diagnostic work-up. International toxicology experts point out that the high-risk to the patient (patients are often completely asymptomatic until after irreversible liver damage has occurred) as well as the relative low cost of the test far outweighs the impact of liver failure and possible death if paracetamol toxicity are missed [23]. However, a cost-benefit analysis is perhaps warranted in a resource-restricted healthcare system, and alternative strategies might be appropriate. Intentional overdose patients are well known to provide inaccurate clinical histories, and although data are limited, universal screening identified one potentially toxic paracetamol level for every 45–365 patients screened [24,25]. On the other hand, patients denying both paracetamol and multidrug ingestions have been considered reliable historians in resource limited settings and universal screening was

deemed unnecessary [26]. This was similar in the current study, where the one patient with a toxic level where paracetamol ingestion wasn't elicited in the history had a multidrug ingestion. Better data from large studies are needed, but until then filtering out the potentially toxic patient should remain a priority. In healthcare systems that can both afford it and have the capacity to treat these patients, it seems justified to implement universal screening for deliberate paracetamol overdose patients. However, a more individualised approach might be needed in resource-restricted systems and preventative public health strategies might be more cost-effective.

A fifth of patients (20%) with self-poisoning were HIV-positive. It is well known that people living with HIV have elevated suicidal ideations as HIV carries unique stressors [27]. Khayelitsha has a high burden of HIV and in addition faces multiple psychosocial complexities; [28] an explorative study to elicit the underlying risk factors is warranted.

This was a retrospective study utilising data from a prospectively collected database. Limited and missing details from databases inevitably incorporate an inherent risk of error and only limited interpretations can be made from the results. Missing data were limited as far as possible by incorporating a chart review. It is possible that some cases could have erroneously bypassed the resuscitation unit. Theoretically, these cases would have had the same triage category since all patients with overdoses are automatically categorised by the South African Triage Scale as 'orange' regardless of the patient's vital signs. Unfortunately, we are unable to give the total number of intentional self-poisoning cases for the rest of the emergency centre as the electronic discharge system was only implemented after the study was completed. One of the challenges with conducting this study was the inadequacies found in the vital signs. Although many trends were similar to published data on intentional self-poisoning patients, generalisability of the results should be done with caution as it was conducted in the resuscitation unit of a single district-level facility in Cape Town.

This is the first study presenting comprehensive data on the burden placed on the resuscitation unit of a district-level emergency centre in the Western Cape, South Africa by intentional self-poisoning patients. Self-inflicted drug overdose occurred frequently with paracetamol being the drug of choice. Healthcare personnel must have an approach to manage these patients appropriately and cost effectively. The utilisation of a poison information centre can potentially reduce the number of patients with no or minor symptoms being managed in emergency centres. The low-grade acuity of most patients raises the question of over triaging and should be investigated further to prevent unnecessary pressure on high-acuity areas.

Conflicts of interest

The authors declare no conflicts of interest.

Dissemination of results

Results from this study were shared with staff members at Khayelitsha Hospital emergency centre through an informal presentation.

Authors' contributions

DJvH had the original idea and wrote the first draft. DJvH, LH, RJG collected the data. All authors contributed to the analysis and interpretation of the data and contributed to the final paper. All authors approved the final version that was submitted.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.afjem.2018.03.002.

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